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AUTHOR Kimble, Gregory A.; And Others
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ABSTRACT

This report covers a series of learning experiments utilizing lists of paired- associates (word pairs). Each experiment consists of three phases. In the first phase the subjects learn a list of paired-associates to a certain performance level. In the second phase (interpolated learning) other sets of paired-associates are learned. Finally, phase three consists of recall of the list from the first learning phase. Here the experimenters were interested in how different kinds of interpolated learning affect recall. The first experiment varied the incentives offered during the interpolated phase. It was found that learning the interpolated list did interfere with recall of the first list (retroactive inhibition); however, the amount of interferences did not vary as a function of the size of the incentive. The second experiment explored the effect of different incentives and different instructions about how to learn the work lists. Regardless of the type of instructions, more of the low-pay-off, interfered-with terms than high-pay-off, interfered-with terms from the original list were recalled. The third experiment increased the amount of interpolated learning to be done. In this case, a pay-off for learning interfering, interpolated items produced less interference for males than females. (LR)

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FINAL REPORT

Motivation and Memory in College Students

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Report prepared by Gregory A. Kimble

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PERSONNEL

Gregory A. Kimble - Principal Investigator

Richard Bruce - Research Assistant

Robert Gehring - Research Assistant

Henry Gorman - Research Assistant

Joanne Zimmerman - Research Assistant

PUBLICATIONS

None

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Henry Gorman - The Discriminative Effects of Motivation on Retention. Ph.D. Dissertation. University of Colorado, 1971.

ABSTRACT

This report describes several studies designed to test a simple theory about the relationship of motivation to retention. The studies all involve a version of the standard A-B, A-C paradigm for the production of retroactive inhibition. Our guiding hypothesis has been that, if a subject's incentives lead him to learn particular A-C interpolated items rather than C-D items or other A-C items, it should be possible to detect the influence of this learning in the loss of identifiable target A-B items. Although the procedures employed were uniformly successful in producing the desired effect upon interpolated learning, the predicted effect upon recall did not occur in a reliable magnitude. Accordingly the hypothesis must be abandoned.

We now suspect that the item-specific interference assumed by the theory is the source of difficulty.

MOTIVATION AND MEMORY

INTRODUCTION

The experimental study of motivational effects upon memory can be traced to the work of Zeigarnik who studied the effects of interrupting her Ss during the performance of tasks and found that a desire to complete the tasks may have caused a differential recall. Following a series of tasks in which half of the tasks were completed by the Ss and half were interrupted before the Ss had finished, the Ss had superior recall of the uncompleted tasks relative to their recall of the completed tasks.

In another early study of motivation and memory, Levine and Murphy (1949) made use of students attitudes as an hypothetical source of information about motives. In this study half of the Ss were judged pre-experimentally to be pro-communist and half were judged to be anti-communist. Both halves read a bitter anti-communist communication and a mildly pro-communist reading. Tests for recall of the two communications showed that at first the anti-communist Ss remembered slightly more of the anti-communist material and slightly less of the pro-communist materials than did the pro-communist Ss. These initial differences increased over time and became significant. Similar studies with somewhat similar results have been done by Alper and Korchin (1952) and Taft (1954).

A common fault with all these pioneer investigations is that they do not explain where or how the motivational factors work in influencing recall. It is clear in some studies (e.g., Levine and Murphy) that the levels of original learning were different between the groups, possibly because of prior experience. More recent studies have exercised better control over previous experience (Weiner, 1966; Weiner and Walker, 1966) but they, too, have flaws that relate to the learning-performances distinction. In general, despite the long and keen interest of psychologists in motivation's effects upon memory, there are no data which clearly demonstrate where or in what manner motivational factors

influence memory without confounding learning and performance differences as they relate to memory.

PRELIMINARY STUDIES

It was with the goal of trying to investigate motivational effects upon memory without confounding learning, performance and motivation and to demonstrate a possible mechanism for the motivational factors operating on memory that this series of studies was begun. We decided that the best method of separating motivation from learning and to not confound these with performance was to employ a modified paired-associated retroactive inhibition paradigm. The modification of the traditional retroactive inhibition experiment was to employ a mixed list of A-C and C-D pairs during interpolated learning and to allow the Ss to allot their practice to these interpolated subjects as their motives dictated. It was then possible to control for the levels of learning on the first list items independently of motivation introduced during the interpolated list learning. It was also then possible to obtain an objective measure of the effects of motivation on retention of the first list as brought about by practice on the various members of the second list.

Three preliminary experiments discussed in this section employed a three-stage mixed-list design. In the first phase all Ss learned lists of paired-associates to a criterion. In the second phase (interpolated learning) the Ss were allowed to practice on the interpolated list pairs in any order and in any manner they wished until they had made a set number of practices. They were induced to allocate different amounts of practice to different materials by differential pay off.

The equipment used in these preliminary studies is essentially the same as that used for the major studies as well. The Ss viewed the paired-associates

as they were shown on the upper-left and upper-right portions of a Lehigh Valley Electronics Human Intelligence Module. The interpolated list paired-associates were controlled by the 12 push buttons on the lower middle panel of the console. Each time a S pressed a particular button, the same paired-associate would appear on the screens for two seconds. There were four rows of buttons with three buttons in each row. The buttons were colored blue, green, red or yellow and there were three buttons of each of the four colors.

In these experiments motivation was manipulated during interpolated learning by providing a differential incentive for learning A-C or C-D pairs. The pairs were identified by the Ss by the color of the buttons which controlled them. For example, the A-C pairs of the first study were those pairs controlled by the blue and green buttons. The Ss were instructed that they could earn extra experimental credit by learning the pairs controlled by the buttons of the designated colors. For the A-C Ss the larger amounts of credit were given for learning the A-C pairs and for the C-D Ss the C-D pairs carried the greater reward. The recall of A-B terms was then scored in terms of errors made on modified free recall of the specifically or A-C interfered-with terms (identified as I errors) and errors on recall of the C-D non-specifically-interfered-wiht items (U errors).

The data for the preliminary experiments are shown in Table 1. In all three studies the Ss allotted significantly more of their practices to the more highly rewarded items (A-C terms for the A-C Ss and C-D items for the C-D Ss). The A-C Ss in these studies showed retroactive inhibition as indicated by the I minus U scores , which were significantly greater than 0 (for experiments one and three, $p < .02$, for experiment two, $p < .10$). None of the C-D groups produced significant amounts of retroactive interference (for experiments one

TABLE 1

	AC items pressed	CD items pressed	AC items learned	CD items learned	I errors	U errors	I-U errors
Expt. 1							
AC group	67.6	32.3	3.7	1.6	3.0	1.93	1.07
CD group	29.4	70.5	2.0	4.5	2.86	2.40	0.46
Expt. 2							
AC group	40.5	9.2	3.9	0.8	3.36	2.04	1.30
CD group	10.4	39.5	1.4	3.4	3.24	2.10	1.14
Expt. 3							
AC group	30.9	18.5	1.9	1.7	2.57	1.68	0.89
CD group	19.1	30.6	2.9	1.8	2.29	1.78	0.50

Table 1 The numbers labeled AC items pressed are the average number of presses on A-C interpolated items. The CD column is made up of the mean number of presses on C-D interpolated items. The AC items learned and CD items learned are average numbers of A-C and C-D pairs learned during interpolated learning. I errors are the average number of interfered-with A-B items missed during recall. The U errors are the mean number of uninterfered-with A-B recall errors. I-U errors are difference scores between I and U errors. These scores are a measure of retroactive inhibition.

and two $p > .20$, for experiment three $p > .05$). And in none of the experiments was the difference between A-C and C-D groups significant on the I minus U measure (all $p > .15$). Thus, providing an incentive for learning interfering materials in these studies led to a signiticant amount of retroactive inhibition but never to an effect that was assignable to an influence of motivation.

In the third preliminary study Ss were asked to report on their use of natural language mediators in order to check on the possibility that the A-C Ss were using them to buffer the A-B pairs against A-C interference. The correlations between the number of associations that a S produced and the number of I errors were computed. For the A-C group this correlation was -0.62 ($t_{26} = 4.0$, $p < .01$) which means that thos Ss who formed more associations during interpolated learning made fewer errors on the recall of the original learning materials. The correlation for the C-D group was -0.30 ($t_{28} = 1.58$, $p > .05$). The difference between the correlations was not significant though the trend in the data is suggestive.

INCENTIVE AND MEDIATION

The relationship uncovered between natural language mediation and interference errors indicated the strong possibility that what had been happening in the preliminary studies was that the Ss in the conditions where they were rewarded for learning interfering materials relied more heavily on associations which reduced interference than Ss rewarded for learning non-interfering materials. Our first major experiment was designed as a further study of this effect. It was hoped that by using different instructions it would be possible to manipulate the amounts of natural language mediation each S used. Additionally, the experiment incorporated a major change which was intended to increase the differences in

interference between the groups. Both groups in the experiment learned interpolated lists composed exclusively of A-C terms with differential pay-off for learning subsets of these terms. Thus, this experiment could be diagrammed as follows.

STAGE ONE	STAGE TWO	STAGE THREE
All Ss learn original list of $A\text{-}B_{1\text{-}12}$	"Blue-green" Ss given high pay-off for learning $A\text{-}C_{1\text{-}6}$ and low pay-off for learning $A\text{-}C_{7\text{-}12}$	All Ss tested for retention of $A\text{-}B_{1\text{-}12}$
	"Red-yellow" Ss given high pay-off for learning $A\text{-}C_{7\text{-}12}$ and low pay-off for learning $A\text{-}C_{1\text{-}6}$	

In this diagram the numerical subscripts designate the number of the paired-associate. Thus $A\text{-}C_{7\text{-}12}$ refers to the six interpolated A-C pairs, which incorporate the same stimuli terms as A-B pairs numbered 7 through 12. The labels "blue-green" and "red-yellow" are derived from the color of the buttons which control the higher pay-off items in the second stage of the experiment for each group. As the "blue-green" Ss learned $A\text{-}C_{1\text{-}6}$ they should forget $A\text{-}B_{1\text{-}6}$, due to retroactive inhibition and similarly the "red-yellow" group should forget the $A\text{-}B_{7\text{-}12}$ pairs as a result of learning $A\text{-}C_{7\text{-}12}$.

Method

Lists The A-B list used in this study was made up of 12 paired-associates whose stimuli were three letter words and whose responses were CVC trigrams of moderate meaningfulness. The A-C interpolated list used the same stimuli as the A-B list and 12 new CVC trigrams, also of 45 to 55% meaningfulness. Both lists were constructed so that none of the pairs shared more than one letter in common with the response term of another pair. Also, no pair had its stimulus and

either B or C response beginning with the same letter.

Subjects Forty-four Introductory psychology students from the University of Colorado were run. Of these, 17 were male and 27 were female. Twelve of the Ss were discarded from the analysis because they failed to respond to the pay-off by allocating at least 60% of their interpolated practices to the high pay-off items. Of the 12 excluded, eight were female and four were male. Common reasons given for their behavior were that they did not think that they could learn the "harder" items or that they enjoyed being in the experiments and did not care about the extra credit.

Procedure The experimental design was a 2X2 factorial in which the two factors were type of instruction for learning and pay-off schedule for interpolated learning. The two types of instruction were Rote and Mediational. In the Rote condition Ss were encouraged to learn the pairs by rote memorization and were required to read the pairs outloud during original learning. In the Mediational condition Ss were encouraged to use mediating associations and were not required to say the pairs outloud. The two pay-off schedules were 10 points for each $A\text{-}C_{1\text{-}6}$ (blue or green) pair learned and 1 point for each $A\text{-}C_{7\text{-}12}$ (red or yellow) pair learned or 10 points for each $A\text{-}C_{7\text{-}12}$ (red or yellow) pair learned and 1 point for each $A\text{-}C_{1\text{-}6}$ (blue or green) pair learned. Each point earned was converted into a minute of extra experimental time when the Ss were awarded credit for their participation. The Ss were randomly assigned to conditions.

The original learning was accomplished through a modification of the method of adjusted learning (Woodworth, 1914). Ss practiced on the original materials by going through first all 12 of the items. Then they were given a modified-free-recall test. Any pairs that they recalled correctly were dropped from subsequent practices. After they had recalled all 12 pairs correctly once, they repeated the entire procedure (Battig, 1965).

At the conclusion of original learning the number of button presses each S made to reach criterion of two runs through the procedure was noted. The number of presses allowed each S during interpolated learning was set at 60% of the presses used on the original materials to the nearest 10 presses with a minimum of 30 presses and a maximum of 70 presses. This was done in an effort to equate the Ss for their learning abilities and the amount of interpolated material they could learn.

Following the allotted number of button presses the Ss were given a modified-free-recall over the inerpolated materials and then on the original items. When these two were completed the Ss were given the stimuli and were asked to recall the interpolated terms and the associations they had used in learning these pairs. Their points were totalled and they were given the credit they had earned rounded off to the nearest high full hour.

Results

The analyses of data were carried out comparing Sex, Instruction, and Pay-off as main variables.

Original and Interpolated Learning The effect of Instruction was significant ($F_{1,28} = 6.18$, $p < .025$) with the Mediational Ss learning the original list faster than the Rote Ss (66.31 to 89.68 presses). There were no other significant differences on the original learning.

Analysis of variance of interpolated learning revealed no significant differences in the average number of interpolated items learned by Sex, by Instruction or the interaction of Sex by Instruction (all $F<1$). The number of high pay-off interpolated items learned was compared with the number of low pay-off terms learned for all groups. The females learned more of the high pay-off items than of the low pay-off terms (mean difference of 2.26, $t_{18} = 2.35$, $p<.025$).

The males also learned more terms which had high pay-off than low, though this difference did not reach significane (mean difference of 2.30, $t_{12} = 1.60$, $p < .10$). The Rote Ss learned more high than low pay-off items (mean difference of 2.25, $t_{15} = 1.74$, $p < .05$).as did the Mediational Ss (mean difference of 2.30, $t_{15} = 2.10$, $p < .01$). These results are not surprising in view of the fact that those Ss not showing greater attention to the high pay-off terms as measured through the ratio of their distribution of interpolated practices were excluded.

Retention On the recall of original learning, all of the Ss recalled fewer of the high pay-off interfered-with terms than of the low pay-off interfered-with terms (average difference = 0.65, $t_{31} = 2.20$, $p < .025$). In comparing the recall of the high pay-off interfered-with terms across all the conditions, there were no significant differences by Sex, by Instruction or for the Sex X Instruction interaction (all $F < 1.0$). This means that overall the effect of motivation on retroactive inhibition was significant, but the effects of Instruction, Sex or the interaction were not.

More mediating associations were reported for the A-C pairs and for their associated A-B pairs when the pairs were high pay-off items than when they were low pay-off items (a difference of 0.56 associations on the average, $t_{62} = 6.08$, $p < .01$). The analysis of variance on the average number of associations on the high pay-off pairs produced no significant F ratios for Sex, for Instructions or for the interaction of Sex by Instruction (all $F < 1.0$). The larger number of associations on the high pay-off A-C and their linked A-B pairs should be evaluated in light of two facts. First, the analysis was limited to those Ss who distributed at least 60% of their practices to the high pay-off pairs. Second, and more important, the average number of associations per S on the high

pay-off pairs and their affiliated A-B items was 1.06 while the average number for the low set was 0.50. The average number of high pay-off items learned was 2.52 and the average number of low pay-off terms learned was only 0.28. The implication of this is that though there were more than twice as many high pay-off mediating associations as there were low pay-off association, this ratio is not indicative of the number of high pay-off terms learned in relation to the low pay-off pairs. Thus, the mediating associations probably protect items from interference, but not enough to account for the results of the previous studies.

The effects of the mediating associations were calculated. The probability that a male S would recall an A-B pair was 0.33 and that probability for a female S was 0.32. The probability that a male S would recall an A-B pair, given that he had made a mediating association (conditional probability) increased slightly to 0.40 and the probability for a female was 0.675. Thus a male was slightly more likely to recall an A-B pair if he had formed a mediating association and the female was more than twice as likely to recall the A-B pair given that she had formed an association. One note of caution in interpreting these data is that the mediating associations could have been formed after the pairs were learned and could merely be an indication of A-B strength or of the difficulty of the A-B pairs rather than being direct contributors to the strength of A-B materials.

Discussion

The hypothesis that Ss are more likely to form mediating associations on the high pay-off items than on the low pay-off terms, and that the associations formed would reduce retroactive inhibition were only meagerly supported. Mediation was implicated as a very strong factor in overcoming interference, but even when the data were heavily weighted in favor of the hypothesis, it was seen to account for a difference of only about 0.25 items. It was also very clearly demonstrated

that the amounts of mediation with these materials are unaffected by instructions. Therefore, while mediation contributes to the variance of retroactive inhibition studes, it cannot alone explain the results so far obtained. Also, mediation is not an easily manipulable factor.

A FOUR-STAGE EXPERIMENT

One possibility for explaining the generally negative results of the previous studies is that the amount of interfering materials learned by the subjects was too little to allow the postulated influence of incentive to operate. Accordingly, in this experiment the Ss learned two interpolated lists under different motivational conditions. The additional interpolated list led to a four-stage experiment of the form: A-B, A-C, A-D, Recall.

Method

Lists The A-B and A-C lists were the same as those used in the previous experiment, an additional A-D list was made up in the same manner as the A-B and A-C lists.

Subjects Ninety-six Ss were run. Forty-eight were males and 48 were females. All were taking Introductory Psychology at the University of Colorado and took part in the experiment in partial satisfaction of a research requirement. The Ss were randomly assigned to groups except that an equal number of each sex was included within each group.

Design The experiment had three basic groups which differed only in the sets of interpolated materials learned and the incentive conditions under which the interpolated learning occurred. All the groups learned an A-B list of 12 paired associates ($A\text{-}B_{1\text{-}12}$) and two interpolated lists (A-C and A-D) of six pairs each during two stages of interpolated learning.

Groups I and II learned interpolated items from either $A\text{-}C_{1\text{-}6}$ and $A\text{-}D_{1\text{-}6}$ lists (which were designated to the Ss as the blue-green pairs) or from $A\text{-}C_{7\text{-}12}$ and $A\text{-}D_{7\text{-}12}$ (identified for the Ss as the red-yellow pairs). Group III learned interpolated materials from either lists made up of $A\text{-}C_{1\text{-}3,\ 10\text{-}12}$ and $A\text{-}D_{1\text{-}3,\ 10\text{-}12}$ (denoted to the Ss as blue-yellow pairs) or from lists made up of $A\text{-}C_{4\text{-}9}$ and $A\text{-}D_{4\text{-}9}$ (designated as red-green pairs). Groups II and III learned the interpolated materials under a monetary pay-off incentive while Group I learned the material without the monetary incentive. Half of the Ss in each group were males and half were females.

Procedure All of the Ss learned an original list of 12 paired-associates by the method of adjusted learning (Woodworth, 1914) to a criterion of one correct for each pair. This was the same as in experiment two.

Immediately after the original learning, all of the Ss transferred to the interpolated lists. It was at the beginning of interpolated learning that the Ss were assigned to their conditions and told of the pay-off (where it was available). Ss learned pairs only from the lists they were assigned. The Ss were given 30 presses on their first interpolated list, after which they were given a modified-free-recall of the list and the two motivation groups' Ss (II and III) were told how much money they had won. This was followed by 30 presses on the second interpolated list and a subsequent test over these materials. Again, the two motivational groups' Ss were told their total winnings.

Finally, all Ss were given tests for retention of the original learning. The first test of original learning was by machine-cued-modified-free-recall in which the S viewed each stimulus on the same screen that it was presented on during original learning, but with the response screen covered. The S was then asked to spell outloud those response terms he could recall from the original learning list.

Second, all Ss were given a paper and pensil modified-free-recall of the original learning.

Results

The results for this experiment are shown in Table 2.

Original and Interpolated Learning. On the original learning the females learned the list faster than the males ($F_{1,90} = 9.43$, $p < .01$) and the interaction of Sex by Group was also significant ($F_{2,90} = 3.33$, $p < .05$). This interaction was chiefly due to the fact that the fastest females were, by chance, assigned to Group III and the slowest males were assigned to this group. The main effect for Group was not significant ($F_{2,90} = 1.54$, $p > .05$).

There were no significant differences for Sex or Group or for the interaction of Sex by Group on the number of interpolated pairs learned. This suggests that whatever advantage the females initially held was overcome by experience with paired-associate learning and it also works against an interpretation of the results based on unequal learning for the groups.

Retention As with previous studies, the amount of retroactive inhibition was measured in terms of the number of errors on recall of the interfered-with A-B items less the number of errors on recall of the non-interfered-with A-B pairs (I minus U errors). The I and U pairs were the same for Groups I and II and were different for Group III. The interfered-with pairs for Groups I and II were $A\text{-}B_{1\text{-}6}$ or $A\text{-}B_{7\text{-}12}$ while the interfered-with pairs for Group III were $A\text{-}B_{1,3\ 10\text{-}12}$ or $A\text{-}B_{4\text{-}9}$. Therefore, the I minus U scores of Groups I and II should be compared with the score of Group III as a control for retroactive inhibition based on I minus U scoring of $A\text{-}B_{1\text{-}6}$. Likewise the scores of Groups I and II are the appropriate control for Group III scores based on I minus U for $A\text{-}B_{1\text{-}3,\ 10\text{-}12}$. The reasons for doing these separate scores are: 1) comparison of Group I and Group II

TABLE 2

	Group I	Group II	Group III
Original Learning Trials to Criterion			
males	7.43	7.43	7.75
females	6.87	7.06	5.31
Interpolated Items Learned			
males	7.56	7.06	5.37
females	8.50	6.81	8.06
I-U Errors based on $A\text{-}B_{1\text{-}6}$			**Machine-cued MFR**
males	0.875	0.437	0.062
females	0.875	1.000	0.187
I-U Errors based on $A\text{-}B_{1\text{-}6}$			**MFR**
males	0.625	0.375	0.062
females	0.688	0.437	0.124
I-U Errors based on $A\text{-}B_{1\text{-}3,10\text{-}12}$			**Machine-cued MFR**
males	0.137	-0.187	0.00
females	0.937	-0.562	0.375

with each other and with Group III on the basis of $A\text{-}B_{1-6}$ allows for the comparison of a group learning interfering materials without extra motivation (Group I) with a group learning the same materials with motivation (Group II) for the effect of motivation and, together comparison of these two groups (Group I and II) with Group III shows the effect on retroactive inhibition relative to a control of learning the interfering interpolated items; and 2) the rescoring on the basis of $A\text{-}B_{1-3,10-12}$ gives an independent check on the effect of motivation on retroactive inhibition. The comparison based upon $A\text{-}B_{1-6}$ will be presented first.

On the first test, the machine-cued modified-free-recall of original learning, the main effect of Group on retroactive inhibition (I minus U errors) was significant ($F_{2,90} = 5.06$, $p < .01$). The effect of Sex and the interaction of Sex by Group were not significant (all $F < 1$). Orthogonal comparisons showed that the weighted means of Group I and Group II was significantly different from the mean of Group III ($F_{1,90} = 5.6$, $p < .025$), which means that there was retroactive inhibition produced here. The means of Group I and II did not differ significantly from each other.

On the second test, the main effect for Group was again significant ($F_{2,90} = 3.9$, $p < .05$). Neither the effect for Sex nor the interaction of Sex by Group was significant. Planned comparisons carried out as on the first test failed to show any significant differences.

The first test interference scores were recomputed using $A\text{-}B_{1-3,10-12}$ as the basis of I minus U. This then allows for a comparison of the retroactive inhibition produced in Group III when compared with Groups I and II as the control groups. The main effect of Group was significant ($F_{2,90} = 3.96$, $p < .05$). The effect of Sex was not significant ($F < 1$) nor was the interaction of Sex by Group significant ($F_{2,90} = 2.33$, $p > .05$). Orthogonal comparisons showed that Group III

had retroactive inhibition on the basis of this rescoring ($F_{1,90} = 4.6$, $p < .05$).

If the male and female means within each of the conditions are compared, on the $A\text{-}B_{1\text{-}6}$ scoring the males of Group II have significantly less interference than do the females ($F_{1,90} = 13.8$, $p < .01$). Similarly, using the $A\text{-}B_{1\text{-}3,10\text{-}12}$ scoring, the males of Group III have significantly less interference than do the females ($F_{1,90} = 9.2$, $p < .01$). No other sex differences were found within each group. What this says is that when there was no pay-off for learning the interpolated items or if the pay-off for learning the interpolated items was neutral with respect to the scoring of interference, then there were no sex differences. However, when there was a pay-off for learning the interfering interpolated items the males had much less interference than did the females.

GENERAL DISCUSSION

The five studies presented in this report have been concerned with the effects of adding an incentive to interpolated learning on retroactive inhibition. These studies have been aimed at detecting changes in item-specific interference. Our general hypothesis has been that if motivation leads the S to learn particular materials, this should lead to the selective forgetting of identifiable target items learned earlier. Our results indicate that we have been successful in manipulating interpolated learning but that the postulated effect upon retroactive inhibition does not occur. In addition to the studies reported here, we have done several others, one complete but most of them abandoned on the basis of negative preliminary data. All of them point to the same conclusion. As a result it appears that the hypothesis is wrong.

We now suspect that the specific point at which the hypothesis is in error is in its reliance upon the mechanism of specific item interference. This program of research has covered a span of several years during which the literature has

increasingly pointed to the conclusion that interference is not item-specific, but rather list oriented, if it exists at all (e.g., Birnbaum, 1970; Postman, Stark and Hanshel, 1969; and Greeno, 1969). One ramification of this is that what was previously an appropriately controlled study on motivation and retroactive inhibition is no longer appropriate and a different design is needed - one which encompasses list interference. Such studies have yet to be carried out successfully.

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